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Studies on Aspiration Biopsy of the Thyroid

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Cytological examinations were performed with 84 cases of thyroid diseases for the detection of thyroid cancer. Aspiration biopsy was made with an injector provided with a fixative solution consisting of equal amount of alcohol and ether. In 14 out of 17 cases of cancer, or with the probability of 83%, this cytological examination worked out to establish a definite diagnosis. Since this method is simple and highly reliable, it is available for routine examination of patients with thyroid diseases.

INTRODUCTION

For preoperative diagnosis of thyroid cancer, cervical x-ray study, ultrasonic examination, scintigraphy by means of radioactive iodine, biochemical test and other auxiliary tests are used but palpation is the most valuable means of diagnosis at present. Since probability of definite diagnosis by means of palpation greatly depends on the experience and perception, lacking scientific basis, needle biopsy or histoligical examination of frozen section obtained during operation has been generally performed as a means to obtain definite diagnosis. Incisional biopsy of thyroid cancer prior to operation should be avoided since it may cause scattering of cancer cells into the srrounding tissues.

On the other hand, cytological examination upon aspiration biopsy using a fine injection needle iseasily available as routine examination of outpatients since it is simpler in technique than the conventional needle biopsy, causing no pain nor complication such as hemorrhage. Moreover, this method results in a high reliabiality of definite diagnosis.

For the purpose of diagnosing thyroid cancer, we performed cytological examination by means of aspiration biopsy for the patients with various thyroid diseases who underwent clinical examination and/

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or treatment in our department during the period of about one year after November 1970. It was most important in cytological examination to obtain specimens of little degenerative cells. From this point of view, we provided a fixative solution in the injector in advance so that the aspirated cells might be fixed instantaneously, thus preventing their degeneration due to dehydration. Aspiration biopsy seemed to be an excellent method for preoperative diagnosis of thyroid cancer if it was performed by those who were skilled in morphology of cytological examination. The technique, method and results of our test are described below.

MATERIAL AND METHOD

During the period of about one year from November 1970 to October 1971, cytological examination was performed for 84 cases of thyroid diseases as shown in Table 1. For these cases, histlogical diagnosis was established upon examination of specimens obtained by surgical procedures.

Aspiration biopsy of the thyroid gland was conducted in the following procedure. Approximately 1 ml. of a fixative solution of equal amount of ether and 99.5% ethanol was placed in an injector of 2−5 ml., to which an injection needle of 22−gauge or finer was attached; the injector was punctured directly into the mass; the injection needle was moved back and forth two or three times while applying negative pressure; and thus cells were aspirated into the syringe. (Photo 1) For puncture, it is recommended to select a site

Table 1.

Comparison between Cytologic Diagnosis and Histologic Diagnosis

Aspiration biopsy / Histology	neg.	dysplasia			posit.	Total
		mild	mod.	sev.		
Almost normal thyroid	4					67
Simple goiter	(1)					
Diffuse goiter with hyper-thyroidism	9					
Subacute thyroiditis	1					
Chronic thyroiditis	18	4		4	1	
Adenomatous goiter	2	1	1			
Adenoma	20		1			
Thyroid cancer	3		1	2	11	17
Total	58	5	3	6	12	84

where the presence of cancer is most suspected by careful palpation. It is also encouraged to puncture and aspirate the firm and solid mass as much as possible. The fixative solution should not leak into tissue during the puncture.

Aftep aspiration, the first drop in the needle should not be lost since the cells are most abundant in this first drop. With proper care not to lose the first drop, the content of the syringe was transferred into a centrifugal tube which was then centrifuged and smear slides were prepared out of the sediments. An aspiration biopsy provided 3–4 slides. The slides were stained with Papanicolaou's method for permanent preservation.

CYTOLOGICAL FINDINGS OF THYROID DISEASES:

Three criteria were set forth for the cytological diagnosis of aspiration biopsy, namely, negative, dysplasia and positive. Dysplasia was further classified into mild, moderate and severe according to differentiation and/or maturation of the cells. The results of cytological examination for which final histological diagnosis was established are shown in Table 2. Cytological findings for histological diagnosis will be described later.

1) ALMOST NORMAL THYROID: Though four cases had a complaint such as slight swelling in the thyroid gland, histological study revealed no abnormality and cytological examination showed cylinder epithelial cells, seemingly deriving from follicular epithelium. However, these cells showed no abnormality and were diagnosed to be negative for cancer.

2) CHRONIC THYROIDITIS: Of the 27 cases, 18 were diagnosed to be negative for cancer cell, 1 positive, 4 milb dysplasia and 4 severe dysplasia. Such abnormalities of the follicular epithelium were indicated to be reactive changes to inflammation. In the one case diagnosed to be positive for cancer cells, histological study also revealed remarkable abnormality of the cells and malignancy was also suspected. However, in absence of capscular invasion and metastasis to the lymph nodes, the final diagnosis was made as chronic thyroiditis. Histological study of abnormal cells suggested that germinal center cells (reticulum cells) of the lymph follicle were aspirated. (Photo 6)

The characteristics of chronic thyroiditis in cytological examination was that abnormal cells, if any, were scattered singly among the lymphocytes. (Photo 7)

3) DIFFUSE GOITER WITH HYPERTHYROIDISM: All nine cases were negative for cor cancer cells in their cytological examination. The follicular epithelium showing proliferative changes was observed as cylinder epithelial cells without dysplasia, although it was

anticipated to appear as dysplastic.

4) ADENOMATOUS GOITER : Of the four cases of adenomatous goiter, two were diagnosed to be negative for cancer cells and the other two as dysplasia. The degree of dysplasia was mild in one case and moderate in the other.

5) ADENOMA : Of the 21 cases, one showed moderate dysplasia cytologically. It was surprising that dysplastic cells were noted only in one case among the cases of adenoma whose histological study showed proliferative changes. (Photos 2, 3)

6) SUBACUTE THYROIDITIS : There was an opportunity to biopsy one case. Multinucleated giant cells were observed in the cytological smears as well as in the histological specimens. (Photos 4, 5)

7) CARCINOMA : Of the 17 cases of thyroid cancer, 16 were of papillary type and 1 follicular type. In cytological examination, 3 cases were negative for cancer cells, 1 moderate dysplasia, 2 severe dysplasia and 11 positive. The cancer cells diagnosed to be positive were hyperchromatic with large nuclei, large prominent nucleoli and high nuclear-cytoplasmic ratio. It is characteristic of cancer that these cancer cells are grouped with several cells in a nest. (Photos 8, 9)

PROBABILITY OF DIAGNOSIS BY CYTOLOGICAL EXAMINATION :

Of the 84 cases for which hcstological diagnosis was established, 67 cases were benign goiter and 17 were thyroid cancer. It is a problem that 4 cases of severe dysplasia and 1 case of positive for cancer cells were found among the cases of benign goiter.

On the other hand, there were were 3 cases of so-called false negative who were diagnosed to be negative for cancer cells despite the fact that their histological diagnosis was thyroid cancer. The cytological diagnosis was correct in 14 out of 17 cases of thyroid cancer or in 83% of the cases. In retrospective view of the 3 false negative cases, the first case was so-called malignant adenoma, the second case was a coexistence of cancer adjacent to adenoma, and the third case was a coexistence of cancer with multiple adenomas in which puncture did not reach the cancer but the adenoma. So-called malignant adenoma, which has a problem in histological examination, is also difficult to diagnose in cytological examination. Definite diagnosis should depend upon the observation of biological and clinical behaviors. The second and third cases were those wherein puncture did not hit the cancer. In such cases, puncture should be attempted repeatedly at different sites where cancer is suspected by palpation.

DISCUSSION

Nobody has ever reported cytological examinations systematically by means of aspiration biopsy to established definite diagnosis of thyroid cancer prior to operation. We have presented cytological examination for the diagnosis of thyroid cancer and other inflammatory diseases including benign tumors, and obtained certain characteristics of the diseases.

Most important for cytological examination of thyroid diseases is to obtain less degenerated specimens. At the initial stage of this study, we used to have the syringe contain physiological saline solution and aspirated the cells into the syringe. However, this method caused difficulties in establishing diagnosis because of changes of the cells such as degeneration before the preparation of permanent specimens. Hence we have replaced the physiological saline solution with a mixture of ether and alchol as a fixative solution to be provided in the syringe. This method has completely eliminated degeneration of aspirated cells and made it possible to obtain satisfactory specimens.

No complication should be caused by aspiration biopsy as long as the fixative solution in the syringe is not leaked out into the tissue during the process. In fact, there was no complication in any case we performed aspiration biopsy.

This method may be advantageous for routine examination, being simple in technique, requiring no complicated apparatus and being readily available at the outpatient clinic and at the bed side only if the fixative solution is on hand in addition to syringes and needles which are used daily.

It is desirable that those who perform aspiration biopsy of the thyroid are skilled in palpation of the thyroid gland.

Correct diagnosis was made for 14 out of 17 cases of cancer, the probability being 83%. As described above, 1 case of so-called malignant adenoma was diagnosed cytologically as negative for cancer cells and 2 cases of coexisting cancer and adenoma as false negative. Dysplastic cells were not noted in the cases of so-called malignant adenoma.

As to the cases of coexisting cancer and adenoma, correct diagnosis could have been established if the puncture hit the cancer cells. This encourages conduct of adequate palpation and repeated aspirations from where cancers is suspected. The difficulty to diagnose so-called malignant adenoma in cytological examination may be inevitable since it is not possible to diagnose the disease by inspection, palpation and needle biopsy, but only by histological findings of the excised specimen such as vascular or capsular invation or node metastasis.

In case in which cysts are formed in adenoma or adenocarcinoma, the specimen from the content of cyst may be hypocellular making

diagnosis unavailable. In such cases, it is desired to hit the solid mass as much as possible in aspiration biopsy.

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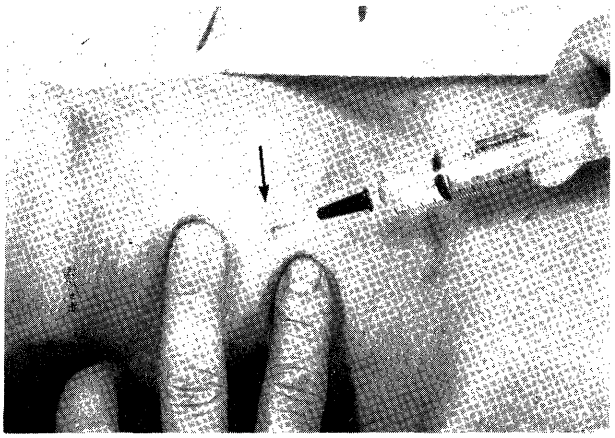

Photo. 1

Transcutaeous aspiration biopsy of the thyroid, showing the daily-used injector with 22 gauge needle or finer.

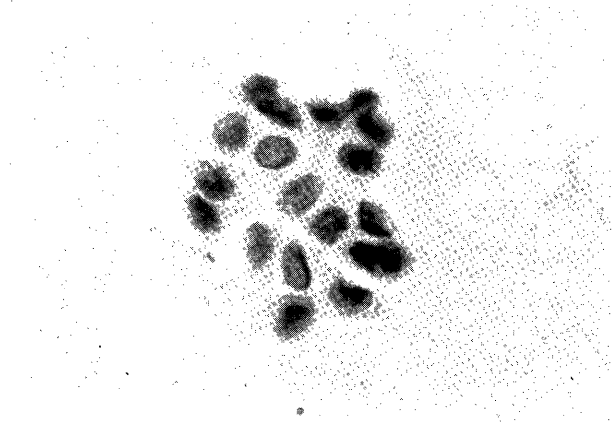

Photo. 2

Cell cluster, aspirated from the thyroid in a case of follicular adenoma. Papanicolaou's stain (×1000).

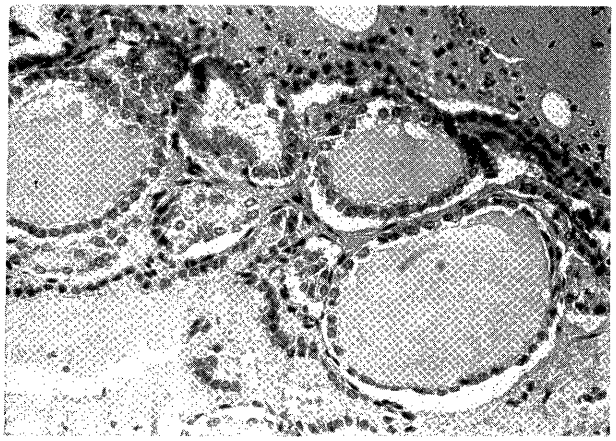

Photo. 3

Histologic section of follicular adenoma. H. & E. (× 200)

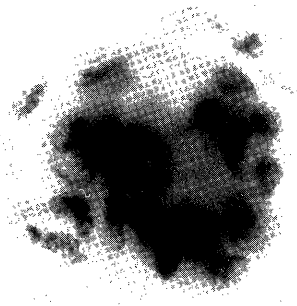

Photo. 4

Multinucleates giant cell, aspirated from the thyroid in a case of subacute thyroiditis. Papanicolaou's stain (× 1000).

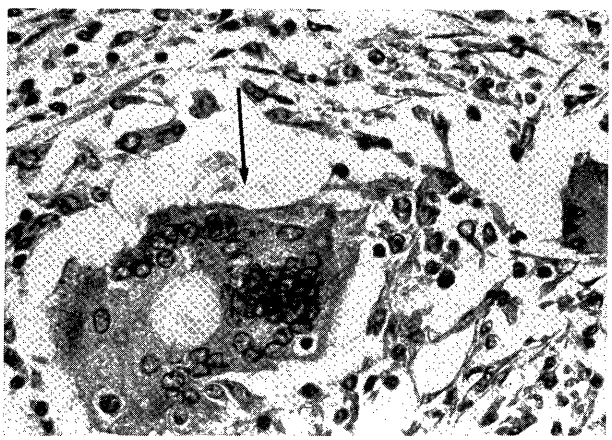

Photo. 5

Histologic section of subacute thyroiditis, showing granulomatous tissue with multinucleated giant cell. H. & E. (× 360).

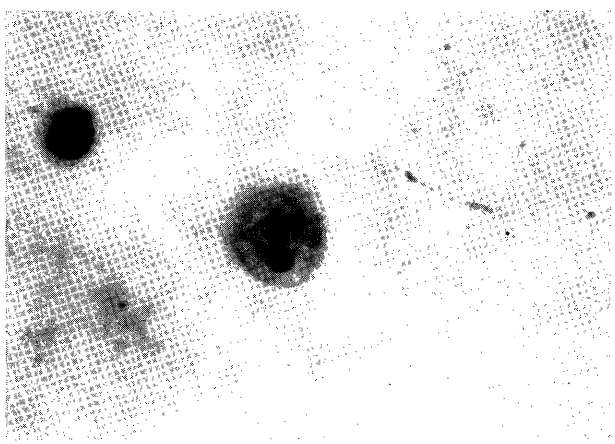

Photo. 6

Reticulum cell, aspirated from the thyroid in a case of chronic thyroiditis and diagnosed to be severe dysplasia cytologically. Papanicolaou's stain (× 1600).

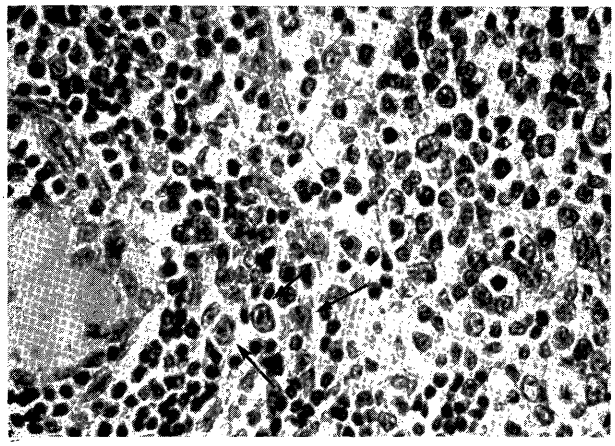

Photo. 7

Histologic section of chronic thyroiditis, showing reticulum cells (arrow) of lymphoid follicle. H. & E. (× 360)

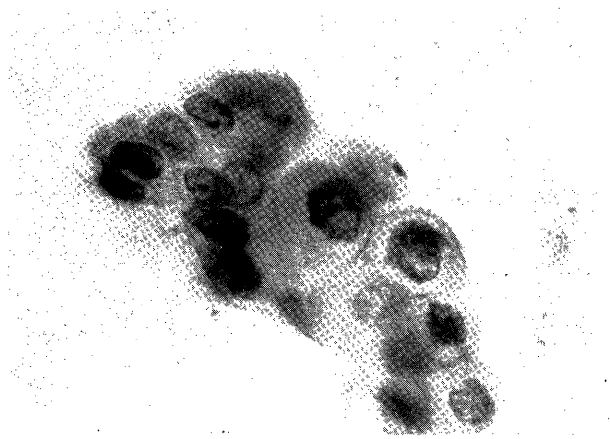

Photo. 8

Prpillary projection of adenocarcinoma. Note the nuclear abnormalities. Papanicolaou's stain (× 1000).

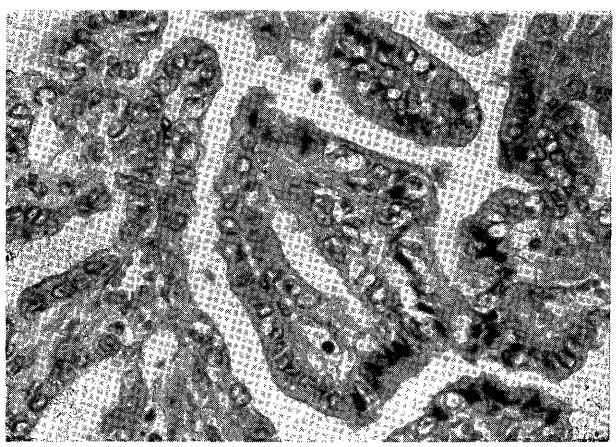

Photo. 9

Histologic section of papillary adenocarcinoma. H. & E. (× 200).